above expression for SO_{out}, the transmission T can be written as

$$T = \frac{m_{11}(\lambda)\cdot S0_{in} + m_{12}(\lambda)\cdot S1_{in} + m_{13}(\lambda)\cdot S2_{in} + m_{14}(\lambda)\cdot S3_{in}}{S0_{in}} \qquad (9)$$

With $x1 = \frac{S1_{in}}{S0_{in}}$, $x2 = \frac{S2_{in}}{S0_{in}}$, $x3 = \frac{S3_{in}}{S0_{in}}$, the transmission T_J, T_K for the two principal states of polarization J, K in dependence on the wavelength λ can be written as:

$$T_J(\lambda) = m_{11}(\lambda) + m_{12}(\lambda)\cdot x1_J + m_{13}(\lambda)\cdot x2_J + m_{14}(\lambda)\cdot x3_J$$

$$T_K(\lambda) = m_{11}(\lambda) + m_{12}(\lambda)\cdot x1_K + m_{13}(\lambda)\cdot x2_K + m_{14}(\lambda)\cdot x3_K \qquad (10)$$

As described above, the states of polarization $x1_J$, $x2_J$, $x3_J$ and $x1_K$, $x2_K$, $x3_K$ have been determined at the wavelength λ_n, which is not necessarily equal to the wavelength λ at which T_J, T_K have to be determined. Here, the approximation has been made that $x1_J$, $x2_J$, $x3_J$ and $x1_K$, $x2_K$, $x3_K$ are constant within a wavelength range around λ_n. In case there is only one point of reference for the wavelength range of interest, it is even assumed that $x1_J$, $x2_J$, $x3_J$ and $x1_K$, $x2_K$, $x3_K$ are constant within the whole wavelength range of interest. The assumption that the Stokes vectors X_J, X_K corresponding to the principal states of polarization J, K do not strongly depend on wavelength is a rather good approximation, because it can be shown that there is usually only a second order dependence of the Stokes parameters X_J, X_K on the wavelength λ. This second order dependence is usually characterized as "second order polarization mode dispersion (PMD)". When the above assumption is made, the wavelength dependence of the loss curves for the J- and the K-state is generated by the wavelength dependence of the matrix elements $m_{11}(\lambda_n)$, $m_{12}(\lambda_n)$, $m_{13}(\lambda_n)$, $m_{14}(\lambda_n)$, whereby $x1_J$, $x2_J$, $x3_J$ and $x1_K$, $x2_K$, $x3_K$ are considered as constants.

It is also possible to track the spectral dependence of the polarization

polarization controller of a corresponding type is used, the parameters α_Q, α_H and 2θ have to be determined for both the J- and the K-state. Here, α_Q and α_H denote the respective angles of the controller's half wave plate and quarter wave plate, and 2θ denotes the angular displacement of a polarization state in the plane of linear polarization (θ-plane) of the Poincaré sphere. More details concerning the determination of α_Q, α_H and 2θ can be found in the appendix "A2. Calculation and Setting of Min/Max Polarization States on the 8169A" of the above-mentioned product note "PDL Measurements using the Agilent 8169A Polarization Controller".

This above-described method can also be used to obtain the PSP mode spectra of other optical properties, like for example group delay, after using the analysis of the Mueller matrix to set the instrumentation.

In Fig. 7, the calculated J- and K-state loss curves 29, 30 and the measured J- and K-state loss curves 31, 32 are shown together with the J-state calculation error 33 and the K-state calculation error 34. The system uncertainty due to external conditions, such as environmental changes and connection/disconnection of the cable, is typically about 10 mdB or above and depends on how good the fiber is maintained. Considering the above factors, the calculation error is minimum.

So far, two embodiments of the invention have been introduced for deriving the insertion loss curves for the principal states of polarization. In case of planar devices, the TE and TM mode curves are obtained. In the following, it will be described how the polarization dependent wavelength shift can be determined when said two mode curves are given.

In Fig. 8, the TE curve 35 and the TM curve 36 are shown as a function of wavelength. A first possibility for calculating the polarization dependent wavelength shift 37 is to determine the transmission maxima 38, 39 of the TE and TM curves 35, 36, and to subtract the wavelengths corresponding to said